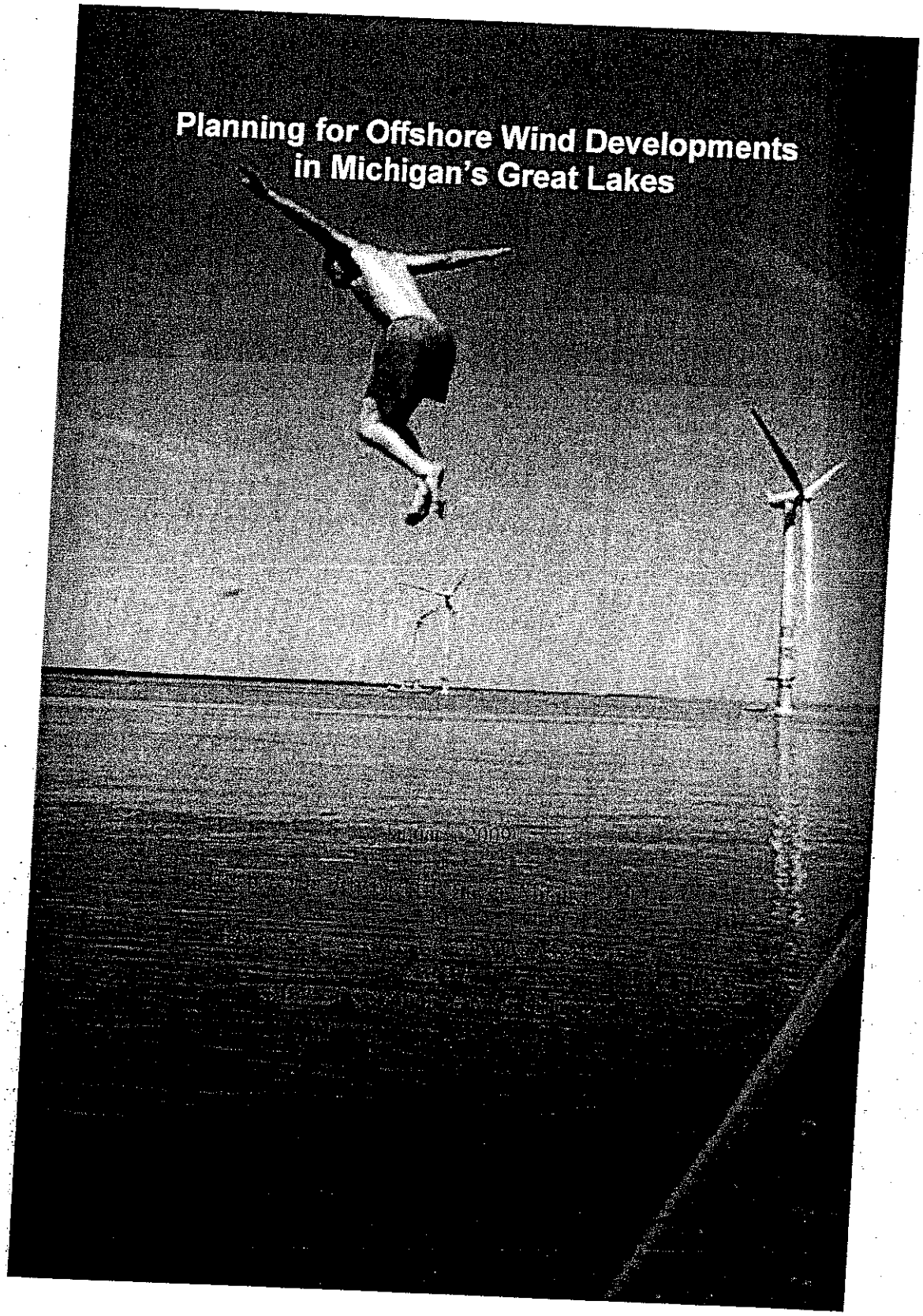
Planning for Offshore Wind Developments
in Michigan's Great Lakes

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Planning for Offshore Wind Developments in Michigan's Great Lakes
Prepared by Michael Klepinger, Mikinetics, LLC for Michigan Economic Development Corporation and the Office of Governor Jennifer Granholm
January, 2009

Purpose and Report Organization

This document supports Michigan policy-makers as the State begins planning for offshore wind power development. In its preparation, a comprehensive literature search was conducted; the most pertinent documents were selected from North America and around the world and a few of these are suggested herein for careful reading by Michigan policy-makers. Lessons learned from around the world are identified and these provide a basis for new policy.

Organization of this report

This paper begins with a description of offshore wind siting policy in Denmark and Britain: the two countries who together host more than 80% of all offshore wind development in the world. This is followed by a review of recent activity of the US Department of Interior, Minerals Management Service and a description of a regulatory framework created for the US Offshore Wind Collaborative. Several coastal states have been active in offshore wind and their experience is reviewed before the presentation of Great Lakes and Canadian offshore wind planning endeavors. Following brief comments about public participation and acceptance of offshore wind, the paper concludes with suggestions for action by Michigan policy-makers.

Need for Planning

In early January 2009, Michigan Governor Jennifer Granholm established an advisory council to *"identify criteria for mapping the categorical exclusion areas for offshore wind development and the most potentially favorable development areas for offshore wind."* The council will complete a first-run planning effort to improve Great Lakes wind resource management. Energy is a basic necessity and energy facilities have impacts that go beyond local areas. The state-level planning process will clarify the responsibilities of Michigan resource management and permitting agencies.

Members of the broadly representative council were charged to identify and come to agreement on State-level interests and responsibilities so that these may be balanced with local values when the first development proposal is made. Pre-planning will make the offshore wind development process easier for all concerned.

Recent studies indicate that if developed properly, offshore wind energy systems in just a small portion of Michigan's Great Lakes could provide a significant portion of the Midwest's electricity needs with pollution-free power. Developing wind energy could diversify and strengthen Michigan's economy, and create jobs while stabilizing energy costs.

Michigan does not yet have specific statutes governing the siting of either terrestrial or offshore wind energy systems. The State feels it should proactively prepare for the possibility of wind energy development in the Great Lakes to ensure that wind energy systems are not constructed in locations that would unduly degrade Michigan's tourism, recreation, shipping, or fishing industries, its wildlife populations, its property values, or its quality of life.

1 Introduction

The worldwide rush to develop renewable energy, particularly to wind energy, is real. Recent articles in the popular press and industry journals describe an exploding world market. Wind generator component supply backlogs of 2 to 3 years are reported all across the wind industry. The world's leading wind turbine manufacturer, Vestas Wind Systems A/S of Denmark, was recently characterized as having nearly $6.5 billion worth of outstanding orders (BBC, 2008). According to the American Wind Energy Association, the wind industry invested more than $15 billion in domestic wind farm construction in 2008, and added thousands of domestic employees in construction and operations.

Rapid growth in the US, both onshore and offshore, is predicted in the US Department of Energy report: *20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply.*[1] According to the US Department of Energy National Renewable Energy Laboratory (NREL), *"Offshore wind generated electricity in the United States has the potential to become a major contributor to the domestic energy supply...because it can compete in highly populated coastal energy markets where onshore wind energy is generally not available"* (Musial, 2004). In contrast to the winds of the Great Plains, high-quality offshore wind resources are relatively close to coastal population centers.

The first offshore wind development was a single turbine demonstration project in the North Sea in 1991. Since then, offshore wind machines and offshore site developments have grown much larger to capture economies of scale. As the industry begins to mature, European industry experts are now projecting that offshore wind energy development companies will absorb the majority of European wind turbine production capacity over the next decade.[2]

The trend toward offshore is explained in part by a shortage of suitable land in Europe and in part by the rich wind resource over the sea. And while North American offshore wind development is not yet as "hot" as European offshore wind, the North American offshore market is considered by industry to offer an open frontier - where the rules are just being formulated and where demand for wind energy products will mushroom.

Michigan is well placed to supply North America's burgeoning demand from the heart of the Great Lakes. The state is blessed with plentiful wind resources, a highly-skilled labor force and an industrial heritage known around the world.

Wind resource mapping conducted for DOE/NREL and a recent study conducted by the Land Policy Institute at Michigan State University make it clear that Great Lakes wind is a unique and valuable resource (AWS-Truewind, 2007; LPI, 2008). Like the state's Great Lakes fisheries, its vistas and its drinking water, Great Lakes wind resources are held in public trust. How should this public trust be managed? Michigan needs to begin a long-term planning process for siting

[1] Web reference http://www.20percentwind.org/20p.aspx?page=Overview
[2] Web reference EWEA http://www.ewea.org/fileadmin/ewea_documents/documents/Statistics/offshorestats07.pdf

offshore wind development. Michigan policy-makers would like to be well prepared for offshore wind proposals that can address the diverse needs of Great Lakes stakeholders.

Michigan owns a vast wind resource but the state does not have offshore wind resource policy or regulations; this raises two fundamental questions:

Where should offshore wind be permitted/encouraged/discouraged?
How should Michigan prepare for its first development applications?

2 European Experience

United States offshore wind policy-makers, citizens, wind development companies, resource managers and regulators can take valuable lessons from the last two decades of European experience. Virtually all of the world's roughly 1,400 MW of offshore wind in production (as of late 2008) is located in European waters.[3]

Two European countries, the United Kingdom and Denmark, account for more than 80% of the world's offshore wind development. These two countries are unique in that they have evolved effective planning programs to identify preferred offshore areas before site leasing commences. Notably, Britain and Denmark have also created simplified "one-stop" permit processing authorities to streamline site development.

Offshore wind planning and siting are different endeavors (Pasqualetti, 2004). There are several European countries that have conducted planning in one form or another. Researchers have investigated the planning "success" rates of different nations from several perspectives. For example, if the number of installations is a good measure of success then what variables have caused some countries to pull ahead of others? Geographical variables such as quantity of wind resources near load centers are in themselves insufficient to explain patterns of implementation of wind power. A recent investigation found the following four variables when looking at nations with the highest rates of wind system development:

- the presence of a planning regime;
- an existing financial support or state incentive system;
- lower value given to local landscape preservation at development sites;
- higher degree of local wind power ownership (Toke et al, 2008).

Some of these "success variables" can be managed, influenced or controlled by the state and some of them cannot. Michigan's primary concern is with the first of these variables: planning and creating the state's first policies for siting offshore wind.

2.1 European Leadership in Siting Offshore Wind

Early statements of the European Wind Energy Association (1982) suggested that offshore wind turbines could eventually supply a large proportion of Europe's power. Many years passed before technology and policy developments resulted in a Swedish offshore field; one small turbine was installed in 1991. The first ten years of offshore development, mostly in very shallow water but sometimes at considerable distance from shore, provided valuable lessons, however the decade resulted in limited production of electricity. Worldwide, total offshore capacity had reached about 100 MW by the year 2001.

[3] For an overview map and selected site details see web references www.offshorewindenergy.org and EWEA Offshore Statistics http://www.ewea.org/fileadmin/ewea_documents/documents/statistics/offshorestats07.pdf.

Location	Year	#size = total MW	Depth (m)	Distance from shore
Nogersund (SE)	1991	1 x .22	7	250 (m)
Vindeby (DK)	1991	11 x .45 = 5MW	3 to 5	1 to 5 (km)
Medemblik (NL)	1994	4 x .5 = 2MW	5 to10	750 (m)
Tunø Knob (DK)	1995	10 x .5 = 5MW	3 to 5	6 (km)
Dronten (NL)	1996	28 x .6 = 17MW	5	20 (m)
BockstigenValor (SE)	1998	5 x .5 = 2.5MW	6	3 (km)
Middelgrunden (DK)	2000	20 x 2 = 40MW	3 to 6	3 (km)
Utgrunden (SE)	2000	7 x 1.4 = 10MW	7 to 10	8 (km)
Blyth (UK)	2000	2 x 2 = 4MW	8	800 (m)
Yttre Stengrund (SE)	2001	5 x 2 = 10MW	6 to 10	5 (km)

Today, tallies are made in gigawatts (GW). Turbine sizes and field sizes increased significantly in the decade following 1999 and worldwide offshore capacity rose more than tenfold. Today's turbines range in size from 2 MW to 5 MW nameplate capacity and 7.5 MW prototypes are being developed.[4]

Recent industry estimates suggest that between 20,000 MW and 40,000 MW (20 to 40 GW) of offshore wind energy capacity will be operating in European Union waters by the year 2020. European experts now suggest that less than 5% of the North Sea surface area would be needed to supply roughly 25% of the EU's electricity demand; however, there are several obstacles to meeting these projected capacity levels (EWEA, 2007). Considering the limited number of wind equipment manufacturers and offshore wind development companies, and considering the rapidly-growing worldwide demand for new offshore wind deployment, it is easy to see why governments around the world are moving quickly to clarify their local requirements for offshore wind siting and development.

In a 2006 report to a North Sea consortium, the authors capture the fundamental differences in offshore wind resource planning among European countries:

> "The planning and building of offshore wind farms have proven to be subject to complex and complicated processes. Regarding possible locations for offshore wind farms, the Netherlands and Belgium do not explicitly designate preferred areas, contrary to Germany, the UK and Denmark. The Netherlands and Belgium exclude several areas reserved for other uses (e.g. excavation, shipping routes, Habitat or Birds Directive) whereas Denmark and the UK have done strategic environmental assessments in order to point out suitable areas for offshore wind activities. We [note the outstanding] results in both Denmark and the UK" (Zeelenberg, 2006).

Europeans have paid for their lessons learned (and North Americans can be the beneficiaries). After several years of offshore wind field development, European leaders gathered in Copenhagen during 2005 to discuss common offshore wind issues and opportunities. Their policy conversations resulted in the Copenhagen Declaration, which reads, in part:

[4] In April 2008, the British Crown Estate signed an agreement to purchase a prototype of the world's largest offshore wind turbine, the 7.5 megawatt MBE turbine manufactured by Clipper Windpower of California.

- "Participants recognise the importance of more efficient consenting [i.e. permitting] procedures which build on past experience and are in proportion to the scale of the project and the perceived impact.
- Participants stress the need to ensure good quality assessments, especially when dealing with sensitive areas and to further develop methodologies for such assessment.
- Participants recommend the establishment and use of marine spatial planning instruments to arrive at optimal site selection."

Two years later, European policymakers, representatives from industry, and scientific institutions gathered in Berlin for the "European Policy Workshop on Offshore Wind Power Deployment" and the Berlin Declaration was the result. The Berlin Declaration encourages member States *"to share examples of consenting procedures and identify opportunities for streamlining, as well as sharing examples for decision-making strategies under uncertain ecological baseline information."* After 15 years of experience, and while faced with increasing demand for renewable energy, the European policy declarations of both Copenhagen and Berlin emphatically encouraged nations to clarify offshore wind development siting and public engagement requirements.

2.2 Denmark

2.2.1 Offshore Wind Siting Policy in Denmark

The Danes, with 40% of the world's installed offshore wind power as of early 2008, are recognized as leaders in wind energy deployment, in basic wind technology research and in wind turbine sales. Wind power provides more than 20% of Denmark's electricity and the Danish company Vestas is the world's largest turbine supplier. The first Danish offshore wind farms were developed, not without controversy, at Vindeby (1991) and Tuno Knob (1995).

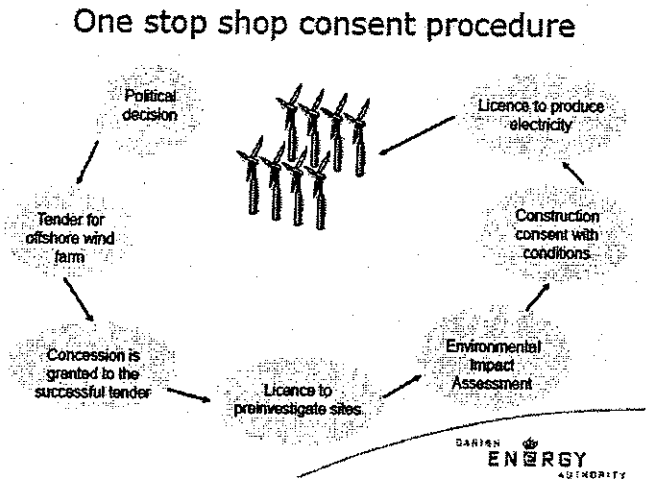
Denmark is a constitutional monarchy with 14 counties and 275 local authorities, however, under Danish law, the territorial sea is not covered by local on-land regulation (in contrast, neighboring Swedish law gives local jurisdictions some authority over territorial sea developments). The Danish government set aggressive targets many years ago and Denmark's financial support system for wind was the earliest and remained generous and consistent until the end of 2001. With this framework, the earliest Danish offshore wind developments were seen by some as "top down" impositions of a distant government. They were said to be less than respectful of local citizen concerns. With the passage of time, press accounts in shoreside communities have described increasing local satisfaction with most of the developments.[5]

Strategic planning of future Danish offshore sites began in earnest in1992. Between 1992 and 1995, an assessment of the impact of offshore wind farms on coastal landscapes was conducted by the Danish Offshore Wind Turbine Committee of the former Ministry of Environment and Energy. It recommended that offshore wind farms should be concentrated in relatively few areas. In 1995, the Danish Energy Authority identified a developable area of approximately 1,000 square kilometers (this was an area estimated capable of generating 7,000 to 8,000 megawatts).

[5] On the Tuno Knob project, see for example web reference www.capewind.org/printarticle10.htm

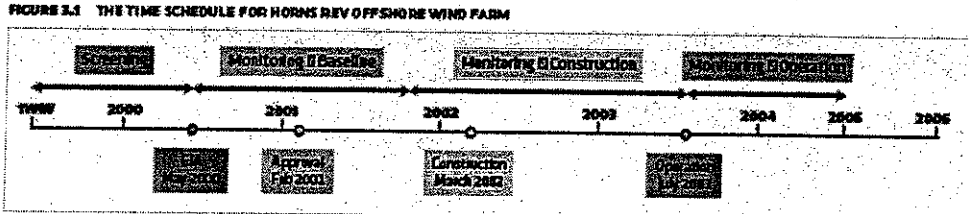
The plan designated 15 possible areas suitable for offshore wind farms and these were narrowed to 5 finalists before an open call for proposals was issued in 1996.

In 1997, a government planning effort, the *Offshore Wind Turbine Action Plan for Danish Waters*, established a new framework for the development of offshore wind energy (Danish Offshore Wind-Farm Working Group, 1997). The plan sought to concentrate offshore wind energy in a few areas to maximize the use of existing infrastructure and to minimize development impacts on shipping routes, military interests and the coastal landscape (Shaw *et al*, 2002). All of the areas were located at a distance of 15 to 30 kilometers from the coast and in water depths of 4 to10 meters. The Danes then adopted a one-stop permitting (consent) process within the Danish Energy Authority (DEA). Several different Danish authorities administer regulations concerning the territorial sea, but all authorities are now linked through the DEA.



In 2002, the first truly large-scale wind farm (160 MW) was built at Horns Rev off the west coast of Denmark, followed the next year by a 165 MW field at Nysted off the east coast. These two fields remain the world's most-studied and most often cited examples of offshore wind.

The timeline for the Horns Rev project:



The time schedule is presented including the Environmental Impact Assessment (EIA), approval, construction, operation (the lower line) and the environmental monitoring phases (the upper line). The transformer platform was erected in October 2001 prior to the rest of the construction work. The wind farm has been operating successfully since December 2002.
(DEA, 2008)

Today's offshore wind pre-investigation and siting procedures are laid down in the Danish Electricity Supply Act of 1999. A multi-million dollar environmental monitoring program was

established to chart the environmental conditions before, during and after the construction of the Horns Rev and Nysted sites. The environmental studies were financed with a budget of approximately $15 million provided by Danish electricity consumers through a public benefit fund charge. The studies dealt with:

- Benthic fauna and flora, with particular focus on the consequences of the introduction of a hard-bottom habitat, which is the turbine foundation and scour protection, this also included a survey of the in-fauna community in the wind farms.
- The distribution of fish around the wind turbines and the scour protection, and the effect of electromagnetic fields on fish.
- Studies of the numbers and distribution of feeding and resting birds, performed by aerial surveys, and of the food choice of scoters.
- Migrating birds, including study of the risks of collision between birds and wind turbines.
- The behavior of marine mammals (porpoises and seals) and their reaction to wind farms.
- Sociological and environmental-economic studies.
- Coastal morphology.

The positive results of these studies are being widely accepted and relied upon. The Executive Summary of the 2006 Danish environmental monitoring report notes that: *"...under the right conditions, even big wind farms pose low risks to birds, mammals and fish, even though there will be changes in the living conditions of some species by an increase in habitat heterogeneity."* It also points out that *"...appropriate siting of offshore wind farms is an essential precondition for ensuring limited impact on nature and the environment and that careful spatial planning is necessary to avoid damaging cumulative impacts"* (DONG *et al*, 2006).

In Denmark, the DEA decides whether a wind energy project requires an environmental impact assessment (EIA). The Danes now require that each offshore wind development must conduct site studies before, during, and following construction. At the Horns Rev and Nysted sites, the Danish government required slightly different environmental studies during the construction phase of development. This was done in recognition that the two areas are physically different and have different sensitivity issues. European leaders have learned that siting issues are time-specific and location-specific. Broadly, the following investigations were handled in the construction phase at both of Denmark's largest wind farms:

- Sediment spill monitoring
- Incidents, accidents and oil spills
- Waste handling
- Precautions regarding pile driving/vibration of sheet piles/monopiles
- Sediment depositing
- Marine archaeology
- Registration of navigation in the area

Sampling of benthic communities at turbine foundations was performed at six turbine sites at Horns Rev and at eight turbine sites at Nysted. Both types of surveys included collection of species, photo-sampling and video recordings. Six surveys of the seabed's flora and fauna were performed at Horns Rev and Nysted during both the pre- and post-construction phases. After the two wind farms became operational, the environmental monitoring program focused on the

effects on in-fauna, epifauna and vegetation, fish, marine mammals and birds. The results of the studies are presented in the 2006 DONG report.[6]

The environmental bottom-line, according to the 2006 DONG report, is that *"Danish experience from the past 15 years shows that offshore wind farms, if placed right, can be engineered and operated without significant damage to the marine environment and vulnerable species."*

Action point: Michigan decision-makers do not have guidelines for environmental monitoring during the phases of offshore wind site development but they do have the benefit of European (particularly Danish) experience. Recognizing this during the Michigan 2008 Dry Run, regulatory professionals identified several data gaps for site specific and areawide planning (discussed in section 5, page 27 of this paper). Integrated resource planning and adaptive management techniques anticipate these data gaps. Field studies should be scheduled and evolving research targets will be needed. Data gaps should be expected and accommodated in the process of offshore wind resource management.

The Danish Committee for Future Offshore Wind Turbine Locations, convened to recommend future offshore wind siting policy, published its long-range planning report in April 2007 (DCFOWTL, 2007). This planning committee's work, while it was based on the 1997 mapping effort, gave increased attention to the economics of electric grid transmission and refined the list of preferred exploration areas. The planning project attempted to take into account public values such as nature preservation areas and visibility.[7] It applied criteria to its territorial seas and prioritized 23 sites in seven developable areas. A national target of 4,600 megawatts (this corresponded to approximately 50% of 2006 Danish electricity consumption) was set and developable areas were identified at a distance from the coast of 15 to 50 kilometers and at a maximum water depth of 40 meters.

It is worth noting that, in addition to encouraging wind development in seven special areas, the Danes have also adopted a regulatory procedure known locally as an "open-door procedure." The open door encourages applicants (at any time, without a government request for proposals or a tender) to seek authorization to carry out preliminary studies, establish installations and exploit wind energy *outside the1,000 square kilometers* identified in the 2007 plan. Danish planning efforts have not categorically eliminated very much of the territorial sea from consideration by industry.

A legislative initiative to further consolidate and clarify Danish energy policy was announced in February 2008 and a new Renewable Energy Law was being considered by the parliament in late 2008. It will contain national policy for "overall municipal planning for wind turbines, subsidies for renewable energy plants…and a model for local joint ownership." Pre-investigation of a new

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[6] Preliminary to the DONG report, the Danish consortium Elsam Engineering and ENERGI E2 released *The Danish offshore wind farm demonstration project: Horns Rev and Nysted offshore wind farm environmental impact assessment and monitoring* (October, 2005), which provides a detailed description of field methods and findings.

[7] The committee noted, for example, that "In calm conditions visibility across the sea is extremely good, but due to changing weather conditions visibility will be partially or substantially reduced most days of the year; there are only few days each year when visibility exceeds 19 km."

400 MW field off the north east coast of Denmark was announced in November 2008 and the EIA should be finished in mid-2010.

Importance to Michigan: The Danish experience offers two important lessons. First, a broad public input process did not precede development of the early Danish sites and the resultant scatter-shot pattern, which was determined almost exclusively by market forces, raised concerns among local stakeholders and among regional planning proponents. After a period of angst, Danish policy-makers later adjusted their planning and site approval process to alleviate these concerns. Second, concerns about both the direct and the cumulative environmental impacts gave rise to three types of field studies: baseline, construction and post-production. Comprehensive environmental studies based on the Danish model have eased concerns all across the globe.

2.3 United Kingdom

2.3.1 Offshore Wind Siting Policy in the United Kingdom

The United Kingdom was reported to have 39% of the world's installed offshore wind power in December 2007. The completion of a new offshore wind farm on the coast of Lincolnshire in October 2008 puts the UK's total offshore wind capacity at 3 GW with nearly 2 GW added since 2005. Five more wind fields under construction will bring the UK's total offshore output to almost 8 GW. The aggressive government plan calls for an additional 25 GW worth of offshore wind production and this is said to be enough to provide power for every household in the country while meeting the UK's share of the EU target of 20% renewable energy by 2020. The Crown Estate (owner of the seabed) is central to the development of British offshore wind.[8]

British Rounds

In the UK, wind developments occur in successive open "rounds" tendered by the government. Pricing of wind energy is decided through market competition rather than being set by law as it is in many European countries. Planning has been slow to take hold while public opposition to onshore wind has been more pronounced than elsewhere (and research indicates these two British characteristics may be linked, *cf.* Toke, 2008).

At first, British government wind field siting practices tended to follow industry's lead. The country began its offshore wind development effort (Round 1) by gathering indications of interest from industry in the 1990s rather than by conducting a government-supported strategic planning process to identify preferred areas. There was no screening of the territorial seas by a public body to identify offshore wind areas (BWEA, 1994). Because of technological limits and the cost of grid connection, the Round 1 sites are relatively nearshore and shallow.

In December 2000, the Crown Estate invited applications from developers for options on offshore sites, where, subject to consent (permitting) procedures, offshore wind farms could be developed over the next 3 years. As a result of this, 18 sites were announced in April 2001 (some of these sites are adjacent to each other, so there are, in total, 13 discrete areas). The Crown

[8] Web reference http://www.offshore-sea.org.uk/downloads/Offshore_Energy_SEA_Scoping.pdf

Estate's procedures limited the area of developable seabed to 10 km² within 12 nm of shore and a maximum of 30 turbines would be allowed to generate a minimum installed capacity of 20 MW.

In 2002, the United Kingdom incrementally changed its approach to offshore wind development. Industry was again asked to indicate areas of interest on the territorial seas and the Department of Trade and Industry (DTI, which set energy policies and licensing procedures) identified three areas. Industry considerations (submitted to the DTI by the British Wind Energy Association) included the area's proximity to grid connections market proximity, and criteria related to cost-effectiveness of construction, operation and maintenance of windfarms (BMT, 2003).

The Department of Trade and Industry's paper *"Future Offshore,"* thereafter set out the Government's policy direction and commitment to take a strategic approach to offshore wind development and it set in motion a process to undertake a Strategic Environmental Assessment (SEA) for the three planned locations.[9]

These three strategic areas would become the focus for Round 2 of the Crown's offshore wind farm leasing plans. An SEA was completed for the three areas in July 2003 that relied heavily but not exclusively on a GIS-based spatial analysis. It characterized "maximum" and "relative" constraints to development. The SEA focused on assessing strategic constraints, sensitivities and risks. It did not include a detailed analysis of specific site impacts (BMT, 2003).

DTI issued a guidance including a precautionary coastal exclusion zone ranging in size from 8 km to13 km wide to reduce the visual impact of development and to avoid sensitive, shallow water feeding areas for certain species of sea ducks.[10] The SEA set out development scenarios limiting the total development possible within these three areas to between 4 and 7.5 GW (including the amount already identified during Round 1) and the Crown announced a competitive tender process for Round 2 sites. Industry response was enthusiastic. By October 2003, 41 proposals amounting to 27 GW of installed capacity were received from industry. In December 2003, the Crown Estate announced 15 successful projects and awarded agreements amounting to more than 7 GW of production capacity in the three "strategic zones."

During the SEA in 2003, DTI took into account the significant industry and stakeholder input it received (DTI response paper, no date). Those who commented were concerned about the initial selection process used to identify the three areas, seascape and nearshore impacts, onshore overhead lines and landscape impacts, fishing, and navigation, data gaps and cumulative environmental and economic impacts. DTI expressed its intent to undertake a strategic review of all UK marine renewable energy resources (whether or not commercial technology existed to harness it) to inform planning of future rounds and to conduct a series of studies and surveys required to inform regional SEAs in the future. It said it would systematically compile information on the effects of wind farms so that the data is available to guide debate and decisions in the future. It also noted its intent to "bring forward legislation as soon as possible

[9] An SEA is distinguished from a site-specific Environmental Impact Assessment or EIA in the United Kingdom. The British EIA is similar to the Environmental Impact Statement or EIS in the United States. The SEA is an assessment carried out on government plans and policies prior to their implementation. An EIA is an impact assessment carried out by the developer in support of an application for project consent.

[10] 2008 Web referencehttp://www.offshore-sea.org.uk/consultations/Wind_R2/offshore_wind_SEA_final.PDF

which among other things will provide new powers to create safety zones around offshore wind farms, and to require decommissioning programmes to be established" (DTI response, no date).

In 2004, the DTI advised that offers of leases in future rounds should be limited to defined areas of sea, and that applications for these leases would not be invited until the areas in question had been subject to a Strategic Environmental Assessment. The SEA would "thoroughly consider the impact of future offshore wind farm development including the impact on other users of the sea" (DTI, 2004).

Before a lease can be granted by the Crown Estate, developers are required to obtain all the necessary permits for any offshore and ancillary onshore developments from DTI (the two steps are linked, similar to Michigan's bottomland leasing process. For details on the leasing procedure go to www.crownestate.co.uk.).[11]

The permits required for development are site dependent in the various offshore environments and for many years, a developer was allowed to choose which regulatory scheme to apply under. The key offshore development regulations are derived from four British laws:

- Energy Act 2004
- Electricity Act 1989 – Section 36 (or Transport and Works Act 1992)
- Food and Environmental Protection Act 1985 – Section 5
- Coastal Protection Act 1949 – Section 34

As part of the EIA process, developers are required to take into account the likely significant effects of a development on the environment. The process should cover "direct and indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects" (DTI, 2004).

In the latest government offer, Round 3 (June 2008), eleven broad "development zones" have been identified by DTI (now the Department for Business, Enterprise & Regulatory Reform or BERR). Specific development sites within the eleven zones will be negotiated with industry and the subsequent SEA will examine issues such as the impact on wildlife and habitat, shipping lanes and fishing. The Crown Estate is also planning to invest up to 50% of the cost of obtaining permits for wind sites and it has declared its intent to speed up the development process in subsequent rounds.

The Crown Estate lease agreement gives developers flexibility to adjust the boundaries of their projects by up to forty percent in order to overcome issues identified during the site investigation and stakeholder consultation processes.[12]

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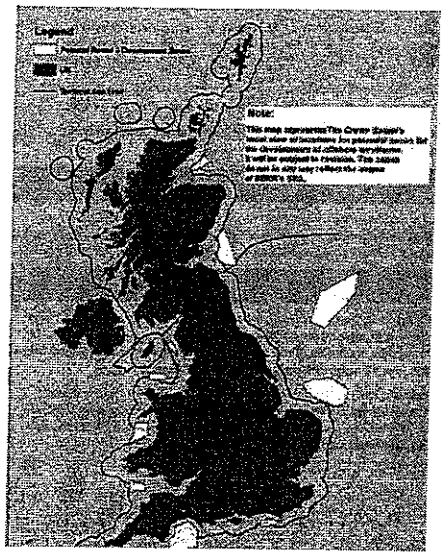
[11] 2008 Web reference http://www.thecrownestate.co.uk/our_portfolio/marine/energy_telecoms/offshore_wind_energy/phases_of_development.htm

[12] 2008 Web reference http://www.thecrownestate.co.uk/newscontent/92-round3-offshore-windfarm-tender.htm

Development Zones

Potential areas for development

- Zones are indicative
- Assessment of economic potential
- Subject to the SEA
- Revisions over the next 3 months
- Not all zones will be issued for development



Round 3 Zones

As of October 2008, the British Parliament is considering new energy siting legislation that will create a streamlined process for seeking approval. This will replace the many planning and consent regimes found in several pieces of existing legislation (streamlining similar to Denmark's One-Stop Shop). The proposed Marine Management Organisation (MMO) and the Infrastructure Planning Commission (IPC) will each have certain responsibilities for the planning and licensing arrangements for offshore wind farm projects. The IPC, an independent body of experts, will have responsibility for offshore wind farms whenever they are "nationally significant infrastructure projects" (the term "significant" referring to projects with a power output exceeding 100 megawatts).

According to the British Wind Energy Association, the 2008 legislation is especially important because in the past it has taken an average of 8 to 9 years to move from identifying an offshore wind site to the windfarm becoming operational, "with some windfarms having been stuck in planning for 5 years."

Importance to Michigan: The UK began its offshore wind development effort by gathering indications of interest from industry (in contrast to conducting a government-supported strategic planning process to identify preferred areas). After about ten years of business activity, the government announced a precautionary coastal exclusion zone ranging in size from 8 km to13 km wide and a planning program to focus on assessing area wide strategic constraints, sensitivities and risks, even in areas where commercial technology was not yet capable of harnessing the wind. Resistance to onshore wind continues to strengthen: around 60% of all wind power applications are rejected by local councils in England and Wales (Toke, 2005). Improvements to the one-stop permitting process are under active consideration as Britain continues its aggressive development of offshore wind.

2.3.2 United Kingdom - Public Engagement

In 2002, the British Wind Energy Association published *Best Practice Guidelines: Consultation for Offshore Wind Energy Developments* (BWEA, 2002). The *Guidelines*, which grew out of stakeholder reaction in communities where the industry first announced an interest, establish a broadly applicable process for site selection. They are targeted to developers, planners and all stakeholders. They are not prescriptive: they offer a set of principles and suggest a range of techniques to come to agreement on where and how to develop offshore wind.

Government and industry created the Collaborative Offshore Windfarm Research Into the Environment (COWRIE). COWRIE is an independent company created *"to advance and improve understanding and knowledge of the potential environmental impacts and benefits of offshore windfarm development in UK waters."* The COWRIE uses a trust fund to which all developers are required to contribute. It is governed by the Crown Estate, BERR and BWEA. COWRIE has infrastructure to handle all environmental data submitted to the Crown Estate by offshore renewable energy developers under the terms of their lease agreements.[13]

In 2004, the British DTI published *Guidance Notes* [for] *Offshore Wind Farm Consents Process*, which clarifies the roles and responsibilities of those involved in the consents process in England and Wales (DTI, 2004). The document also:

- "encourages early dialogue between the developer, consenting authorities, statutory bodies and other stakeholders to help identify potential issues at the earliest possible stage in the planning of any wind farm project;
- encourages the developer to undertake a scoping exercise to determine the main issues/concerns that should be addressed within the Environmental Statement; and,
- encourages the developer to implement established best practice procedures during offshore surveying and construction works."

This places the bulk of the responsibility and cost of site permitting on the private sector. The *Guidance Notes* document does not dictate a mandatory application process for developers to follow in order to obtain all the required consents for a proposed offshore windfarm development. It does however, *"provide the developer with a streamlined approach, identifying best practices by which the processing of applications will be coordinated by DTI. Decisions on whether to follow this approach are a matter for developers."* The document provides telephone and mail contacts in the various departments a developer or stakeholder might encounter while the application is being centrally processed through the ORCU. It provides details of the several laws the departments follow.

Action point: Michigan should consider modifying its MDEQ Great Lakes joint-permitting materials to include a document similar to the British *Guidance Notes*. The document could specifically address the concerns of offshore wind developers and other wind stakeholders – of proponents and opponents and those who have not taken strong positions. The state should also consider establishing a trust similar to COWRIE, and creating a permanent panel to guide offshore wind environmental research, data collection and dissemination.

[13] Web reference http://www.offshorewindfarms.co.uk/Pages/COWRIE/COWRIE_Explained/What_is_COWRIE_/

3 United States Ocean Offshore Regulations

Offshore energy regulations and management authorities in American ocean states are significantly different from those applicable in Great Lakes states but Michigan policy-makers should understand them. Michigan regulators will be interacting with federal authorities during offshore wind permitting in state waters.

The US Department of Interior Minerals Management Service (MMS) recently obtained the lead responsibility for non-fossil energy development in marine environments, but no such federal jurisdictional authority was established for the waters of the Great Lakes (Energy Policy Act of 2005, EPAct, 2005).[14] The MMS has developed regulations that would establish a program to grant leases for alternative energy on the outer continental shelf (by rulemaking) and a draft environmental assessment. The final rule is scheduled for release in early 2009. It will provide some useful lessons and guidance (but no enforceable regulation) to policy-makers as they consider offshore energy development in the Great Lakes basin. The federal role is now clearer, but it remains the responsibility of each Great Lakes state, working with the US Army Corps of Engineers (Corps or USACOE) as the federal lead-agency, to manage and regulate offshore wind development. The Corps is expected to take a lesson from the new MMS leasing program when it is asked to handle freshwater wind development permitting.

Prior to the 2005 Energy Policy Act, the USACOE took the lead in the federal offshore wind permitting process wherever a federal interest was found (saltwater or freshwater). The Corps claimed marine jurisdiction under §10 of the Rivers and Harbors Act of 1899 and the Outer Continental Shelf Lands Act of 1953 as part of its authority to regulate obstructions to navigation in "navigable waters of the United States" and on the OCS. The Outer Continental Shelf Lands Act set up a comprehensive leasing program and system for collecting royalties for oil and gas development activities on the Outer Continental Shelf. The Federal Energy Regulatory Commission (FERC) has asserted its jurisdiction over certain renewable energy developments in coastal waters and this is being tested in recent development proposals. The federal Coastal Zone Management Act (CZMA or CZARA) provides offshore management authority to coastal states while requiring federal activities to be conducted in a manner that is consistent with state action. All significant federal activities are subject to the provisions of the National Environmental Policy Act of 1969 (NEPA).

3.1 Recent DOI/MMS Activity

The MMS, in consideration of its 2005 EPAct authorities, undertook a programmatic environmental impact statement process (PEIS) and decided in December 2007 to establish an alternative energy program (AEAU, pending rule finalization). Significantly, the 2007 PEIS

[14] Section 388 of Energy Policy Act of 2005, PL 109-58 authorizes DOI (MMS) to grant leases, easements, or rights-of-way on the outer continental shelf for activities that produce or support production, transportation, or transmission of energy from sources other than oil and gas. The Act of Congress does not refer to the Great Lakes, other than enacting the Great Lakes Oil and Gas Drilling Ban in Section 386.

includes 52 interim best management practices and policies (BMPs) to be considered as part of the review for any project proposed under this new authority.[15]

In section 2.5 of the PEIS, the MMS considered but eliminated "alternatives" to establishing the new program, including a "no action" alternative. Of immediate interest to Michigan's offshore wind planning is section 2.5.2, *Identifying and Analyzing Specific Areas in Federal Waters Along the Coast with the Greatest Resource Potential*, which reads:

> "In the initial phase of the Alternative Energy and Alternate Use Program [AEAU], the MMS considered it important to leave the [entire] OCS open for possible development. In addition, the MMS lacks (and cannot reasonably attain) the requisite information to "map out" the best areas for alternative energy project activity. The array of potential technologies and the nascent state of the development of some of the technologies does not permit the MMS to foresee where these technologies would be most productive on a national level. Many factors determine the best areas for technology development beyond the simple availability of an energy resource, including market factors, competing uses, and local considerations. That information will be developed in the future with the assistance of coastal States and potential applicants. As the MMS obtains additional energy resource information, it may establish "resource-specific development zones" or "no-development zones."

Much of the "unknown" involves wave, tidal, solar and ocean thermal energy rather than wind energy. These unknowns are largely responsible for causing the MMS to leave the entire OCS open. The MMS will likely create a map of preferred wind development zones before it maps the zones where nascent (wave, tidal and solar power) technology is not yet ready to harness energy resources.

Perhaps the most useful recent MMS activity is the agency's description of wind energy development impacts found in the 2008 final programmatic environmental impact statement (disregarding the references to marine mammals). It does not differ significantly from predictions affirmed by the Danish study of offshore environmental impacts (DONG, 2006.).

> "In general, most impacts would be negligible to moderate for all phases of wind energy development assuming that proper siting and mitigation measures are followed. Human activity on the OCS related to a wind facility is relatively low, with only a few support vessels in operation at any one time during the highest activity period (construction). Potential impacts during the construction phase are the highest, because this phase involves the highest amount of vessel traffic, noise generation, and air emissions. There is a potential for major impacts to some threatened and endangered species of marine mammals, birds, or sea turtles from vessel or turbine strikes, disturbance of nesting areas, alteration of key habitat, or low-probability large spills of fuel or lubricating oil or dielectric fluids, because population-level impacts are possible from injury or death of individual females if population numbers are critically low. Compliance with the regulations and coordination with appropriate wildlife protection agencies would ensure that project activities would be conducted in a manner that would greatly minimize or avoid impacting these species or their habitats. Moderate impacts to fish and fisheries

[15] DOI/MMS PEIS. 2.7.2 Proposed Best Management Practices

could occur due to the establishment of exclusion zones within wind energy facilities. Potential visual impacts can be mitigated through several means, especially siting facilities away from sensitive areas."

An online summary discusses the more notable impacts that could occur during each development phase.[16]

MMS has undertaken a number of studies in support of its new responsibilities. The most relevant of these to Michigan policy-makers could be the upcoming MMS analysis of the likely geographic locations where wind (and other marine renewable) energy development is most feasible. MMS reports that a prioritization of the allocation of resources to fill data gaps should begin with a broad geospatial analysis. Quoting the report:

> "Many of the resource concerns are associated with mobile and migratory species, and baseline studies in broad geographic areas are very expensive. To better identify and prioritize where studies of key resources should be conducted, geospatial analyses are suggested to identify the most likely areas of OCS alternative energy development in the near term. These maps would then be used to identify where more detailed resource studies are needed."[17]

All of the above is preliminary to the "proposed action" by MMS, which (briefly) is the establishment of the Minerals Management Service Alternative Energy and Alternate Use Program on the federal outer continental shelf (through rulemaking). The wind industry has been waiting for new MMS rules, scheduled for release in early 2009.

Action point: The DOI/MMS wind development BMPs should be methodically reviewed and many of them could be adopted by the state as part of its offshore policy framework. BMP statements will affect both "where" and "how" wind developments occur. The federal ocean resource planning area (3.4 million square miles of US territorial sea) is quite large relative to the amount of space required to host even the most optimistic national wind development projections (perhaps ½ % to 1% of the territorial sea – a needle in a haystack or a flea on an elephant?). If Michigan policy-makers decide to set a production target and/or schedule for offshore wind, these new policies would help stakeholders understand the scale of the issues. Michigan has jurisdiction over 38,000 square miles of Great Lakes surface area; the state would need to find less than 200 square miles a to provide as much as 15% to 20% of its 2008 generating capacity with offshore wind. Once Michigan sets broad guidelines for siting and applies an armchair geospatial screening/mapping process (e.g. determine certain categorical exclusion areas and/or best potential areas) the state can prioritize and initiate more detailed studies where appropriate, as is suggested by the MMS approach (following the Danish and British experience).

[16] Web reference http://ocsenergy.anl.gov/documents/fpeis/Alt_Energy_FPEIS_ExecutiveSummary.pdf

[17] Worldwide Synthesis and Analysis of Existing Information Regarding Environmental Effects of Alternative Energy on the Outer Continental Shelf Report (OCS Report MMS 2007-038).

3.2 US Offshore Wind Collaborative Framework

The United States Offshore Wind Collaborative (USOWC) emerged in 2004 just as the Corps was making its initial permitting decisions for Massachusetts' Cape Wind project. The USDOE and Massachusetts Technology Collaborative joined with GE Wind Energy to form the Collaborative. They convened a broad group of stakeholders in Washington, DC to "consider the nationwide opportunities and challenges presented by offshore wind." One of the themes that emerged was offshore siting. USOWC leaders decided that assembling an inventory of approaches to siting from 10 nations around the world (and several states) was a logical precursor to developing a regulatory framework for siting.

In their subsequent work for the USOWC, the Woods Hole Oceanographic Institution identified 20 common features of offshore wind site "access systems." Their report, *Legal and Regulatory Framework for Siting Offshore Wind Energy Facilities*, separated the features of an access system into three broad categories: (1) general management features; (2) allocation of legal interests; and (3) financial features (Hoagland *et al*, 2006; the Hoagland framework).

Their framework for analyzing ocean space allocation decisions for wind farming stipulates that:

> "An area of ocean space should be allocated to wind farming if the resource rents from wind farming in that area exceed the opportunity costs associated with other uses that are excluded or diminished by wind farming."

In this economic framework, the term "resource rent" is defined broadly as "the *net social value* generated by use of the wind resource in an area, after accounting for all private and external (social) costs, including a reasonable rate of return on investment." [emphasis added].

A complex calculation must be made when deciding to allow access to public resources. Natural resource managers must ask, "what is the net social value returned to stakeholders?" A public access system is comprised of the laws, regulations, and agency policies that govern the allocation of a public resource to private sector interests It must satisfy a list of public purposes. Michigan policy-makers and stakeholders are concerned with where, when and how to provide access to Great Lakes wind resources.

Hoagland and his colleagues outline the features behind each of their 3 framework categories:

General Management Features

- Regional Planning: comprehensive review and planning for uses or combinations of uses in a region (planning, not zoning); initial characterization of tradeoffs among potential uses.
- Policy Objectives: characterization of the purposes and rationale for the establishment of a means for providing access to public areas for specific purposes (an "access system").
- Lead Agency: identification of the agency responsible for resource assessments, area selections, and allocations for specific resources.
- Coordinating Agencies: identification of agencies with responsibilities for permitting, conducting ancillary environmental assessments, and consulting or coordinating with the lead agency in carrying out its responsibilities.
- Resource Assessment: process for measuring and assessing resource quantity, quality, location, economic rents, other parameters.

• Area Selection: process for picking specific areas within a region for the development or use of a particular resource; identification of viable alternative areas.
• Multiple Use Decision-making: processes for identifying multiple uses and valid existing rights, characterizing tradeoffs, and resolving conflicts, including public notice and comment; consensus building; stakeholder participation; policy analyses (benefit-cost analysis); arbitration; litigation; others.
• Environmental Review: environmental impact assessments and reporting requirements.

Allocation of Legal Interests
• Allocation Method: procedure for allocating selected areas to developers (first come, first served; competitive auction; auction type; other).
• Instrument: type of instrument establishing legal interests or rights (license, lease, permit, fee simple ownership).
• Interests: precise nature of legal interests or property rights.
• Size: geographic scale of legal interests.
• Tenure: duration of legal interests.
• Monitoring and Enforcement: monitoring and enforcement (including inspections and reporting requirements).
• Transferability: extent to which legal interests may be sold or otherwise transferred to other firms, individuals, institutions.
• Termination: conditions or requirements leading to termination or revocation of legal interests; decommissioning of structures.

Financial Features
• Financial Terms: financial aspects of an allocation that transfer resource rents from a developer to the public, including royalties, rentals, license fees, others.
• Subsidies: financial terms encouraging development, including tax credits, tax deductions, accelerated depreciation, grants, price floors, payment relief periods/conditions, other implicit mechanisms.
• R&D Incentives: financial or other incentives to conduct research and development activities relating to the development of the resource.
• Performance: performance requirements such as due diligence requirements, rentals, bonds, others.

Action point: Michigan policy-makers could consider each of the features in the Hoagland framework as they scope the state's wind development issues and create a vision statement. It offers a comprehensive reference list of considerations for policy-makers and stakeholders from Michigan's diverse communities. Michigan policy-makers could agree on a list of the values that they want their policies to sustain. Considering all "costs," what are the net social values to derive? Energy price stabilization, pollution prevention, coastal community tourism jobs, cash royalties?

4 State Initiatives

In addition to the federal regulatory structure reviewed above, each of the effected US ocean states has begun to define and apply its rules inside their territorial limits. Several offshore wind developments have been proposed in the marine waters of the United States during the past decade and many of them are still considered active proposals, at least by their proponents.[18]

The US Offshore Wind Collaborative recently completed a comprehensive inventory of offshore policy and regulatory activity. For perspective, see: *Status of US Offshore Wind Development Activity by State, September 2008* (USOWC, 2008).

The following section provides an overview of offshore wind policy activity in several ocean coastal states, highlights of lessons learned, and commentary for context.

4.1 Rhode Island – SAMP

In April of 2008, the Ocean State issued a request for proposals *"to design, build, finance and operate a wind generation facility in the waters off its coast to supply not less than fifteen percent (15%) of the energy consumed by Rhode Island's electricity customers."*[19] One of the seven finalists was selected in late September 2008. They have identified a prospective site, which will be confirmed or rejected by the (SAMP) planning process described below.

Rhode Island has been methodical in making a great deal of progress in so little time. The state conducted a stakeholder engagement process described in *Rhode Island Offshore Wind Stakeholders Final Report*, February 2008 (RIOER, 2008). This was preceded, in mid-2007, by the Governor's invitation to *"representatives from Rhode Island communities, the state's environmental community, maritime businesses and industry, and governmental officials to participate in discussions regarding the development of a wind farm in Rhode Island area waters."*

A study commissioned by Rhode Island in 2006 and completed in winter of 2007 had determined that 15% or more of Rhode Island's electricity requirement could be supplied by offshore wind and, further, that 10 specific areas were suitable for consideration as wind field locations. The areas (which totaled 97.75 square miles) were not identified as "development sites" but rather as "areas suitable for consideration." Suitable areas are listed in the report:

Area A – 3.7 sq. mi., off Westerly, state waters, wind speed 7.75 m/s
Area B – 5.36 sq. mi., off Charlestown, state waters, wind speed 8.25 m/s
Area C – 7.55 sq. mi., off Point Judith, state waters, wind speed 8.25 m/s
Area D – 5.32 sq. mi., off Newport, state waters, wind speed 7.75 m/s
Area E – 7.78 sq. mi., off Little Compton, federal waters, wind speed 8.75 m/s
Area F – 9.97 sq. mi., off Charlestown, state waters, wind speed 7.75 m/s

[18] The most accurate list of North American projects can be found at web reference www.offshorewind.net
[19] Web reference www.governor.ri.gov/documents/wind_rfp.pdf

Area G – 22.3 sq. mi., off Newport/Little Compton, state waters, wind speed 8.25 m/s
Area H – 9.69 sq. mi., off Little Compton, state waters, wind speed 8.75 m/s
Area J – 12.94 sq. mi., off Block Island, federal waters, wind speed 9.25 m/s
Area K – 13.14 sq. mi., off Block Island, state waters, wind speed 9.25 m/s

Representatives of the Rhode Island Wind Energy Study team, which had analyzed the state's wind generation potential for the Governor, presented their site ranking methodology, findings, and recommendations during the stakeholder meetings. The report ranked areas according to the amount and cost of producible energy, whether or not the areas were in Federal or State waters, and the visibility of the projects from shore. They reported the state could meet its goal of providing 15% renewable energy within two areas (areas "J" and "K" above).

The stakeholder process included four facilitated meetings in August, September, and October 2007. While planning the last two meetings, the Office of Energy Resources decided that the stakeholder process did not lend itself to development of a definitive recommendation of a single site to be permitted (as had been originally hoped) but that identifying area-specific issues and concerns would help differentiate the relative merits of the 10 identified areas. Industry response to the request for proposals triggered site-specific studies and public input processes. The selected developer will reportedly contribute $3 million to conduct pre-construction studies.

Also of interest, the Rhode Island Coastal Resources Management Council is leading an effort to develop the Ocean Special Area Management Plan (SAMP). It will define use zones for Rhode Island's offshore waters through a research and planning process that integrates the best available science with open public input and involvement. The SAMP should be completed by June 2010, making Rhode Island the first state in the nation to zone its offshore waters for renewable energy development.[20] The selected wind developer will work within the SAMP.

Notably, the trustees of the Rhode Island Renewable Energy Fund financed by an electricity-bill surcharge agreed to provide $3.2 million in funding for the two-year SAMP project. This will be a joint venture between the Rhode Island Coastal Resources Management Council and the University of Rhode Island.

Action point: Rhode Island's identification of 10 offshore areas by a statewide study team and the subsequent open stakeholder engagement process are good models to consider. The first step in Rhode Island made the second step more productive, less contentious. Michigan can use the CZM/SAMP process if it so chooses, however, designation of offshore zones has not been tried in the state or tested in the courts.

4.2 New Jersey – Production Target

In October of 2008, the New Jersey Board of Public Utilities (BPU) chose a preferred developer for a 350 megawatt wind farm16 to 20 miles off the coast. The proposal calls for 96 wind

[20] Authorized by Congress as part of the Coastal Zone Management Act in 1972, a SAMP is a comprehensive set of detailed regulations that lay out how a coastal area can be used. The SAMP project in Rhode Island will create the equivalent of municipal land-use zoning for the ocean and this may-or-may-not facilitate the development of offshore wind.

turbines, some of which could begin generating energy in 2012. One year earlier, the New Jersey Board of Public Utilities board had issued a competitive grant solicitation for an offshore wind farm of up to 350 MW.[21]

New Jersey's approach combines a state-funded environmental review with a state-funded financial incentive package to encourage the development of a 350 MW utility scale research project, a privately funded "pilot facility." This is only the first step in a fairly aggressive, three gigawatt wind energy plan.

In mid-December 2004, New Jersey Acting Governor Richard Codey announced he would sign an Executive Order establishing a moratorium on windmills off the coast to provide time and discussion of appropriate policies needed prior to the consideration of offshore wind energy. The Executive Order also established a Blue Ribbon Panel charged with *"...identifying and weighing the costs and benefits of developing..."* wind facilities and with submitting *"...a report to the Governor providing policy recommendations regarding the appropriateness of developing offshore wind turbine facilities."* Following a 15-month examination, the panel recommended new scientific baseline studies to assess potential natural resource and economic impacts before wind turbine facilities are constructed in coastal waters.[22] In late 2007, the state Department of Environmental Protection (DEP) contracted for an ecological baseline study of the State's ocean natural resources designed to inform the development of offshore wind.[23] Concurrently, the New Jersey Commerce Commission undertook an assessment of the potential costs and benefits of offshore wind turbines to New Jersey's economy. The state developed an energy plan, which in spring 2008, called for development of "at least 1,000 MW of offshore wind by 2012, and at least 3,000 MW of offshore wind by 2020."[24]

The New Jersey Energy Plan of 2008 declares that the Governor's Office, the DEP and the BPU will work together to put in place a series of policies that create increased certainty in the regulatory environment that will encourage the free-markets to construct offshore wind projects in environmentally approved areas. To achieve this goal the Governor will establish an Offshore Wind Planning Group that will consist of the DEP, BPU, the Rate Counsel and public members to develop the necessary plan for guiding offshore wind development. Some of the issues to be considered as part of this plan will include:

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[21] The solicitation read, in part: *"...a competitive incentive and financing program to encourage the development of an off-shore wind renewable electricity generation pilot project serving the electricity distribution system in New Jersey. Funding for this program will come from the New Jersey Clean Energy Program (NJCEP) through the New Jersey Economic Development Authority (NJEDA)."* In addition, the solicitation offers financial incentives in the form of *"... a production incentive paid out over 5 years. A portion of this production incentive could be provided in an upfront payment. This grant solicitation is developed as a performance grant. Payments will be made to the applicant only after the pilot is permitted, constructed and operational. These payments will be tied to the actual electric production on an annual basis."* Web reference www.njcleanenergy.com/files/file/OSW%20Final%20Solicitation100507final.pdf

[22] State of New Jersey Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters, Final Report to Governor Jon S. Corzine, 14-15 (April 2006) Web reference http://www.state.nj.us/njwindpanel/

[23] The study results are expected in 2009. See Solicitation for Research Proposals, Ocean/Wind Power Ecological Baseline Studies, New Jersey Department of Environmental Protection, Division of Science, Research, and Technology, 12 (April 19, 2007). Web reference http://www.nj.gov/dep/dsr/ocean-wind/srp-wind-ocean.pdf.

[24] Web Reference http://www.nj.gov/emp/docs/pdf/081022_emp.pdf

- Impacts to the environment using the DEP ecological baseline study and other environmental studies and study areas if necessary.
- Impacts to the local economies using the recent Commerce report study and other impact studies and areas if necessary.
- Various financing models to support the development of offshore wind.
- Coordination with PJM on interconnection and grid integration issues.
- Creation of a more certain regulatory environment for offshore wind by entering into agreements with entities such as Minerals Management Service or other regulatory entities.
- Coordination of wind energy incentives and efforts to support wind energy development with other states including Delaware and Maryland.

The plan is intended to describe both short-term and long-term actions that make 3,000 MW of offshore wind possible. *"Short-term solutions will include regulatory or statutory changes that allow for innovative financing designs that will make offshore wind a reality given today's markets. Long-term strategies will include State sponsored actions that support the development and commercialization of wind technologies that reduce the cost of installing wind turbines."*[25] The New Jersey Offshore Wind Planning Group will commence activity in early 2009.

Summary: The State of New Jersey has not differentiated offshore areas or set policy for locating offshore wind development but it has moved toward a one-stop approach to permitting. All coastal waters will be subjected to the state's ecological baseline fieldwork and economic modeling. The Governor's 2008 energy plan encourages offshore development.

4.3 Delaware – Delmarva Power and Bluewater Wind

In December of 2007, the public utility Delmarva Power and offshore developer Bluewater Wind came to terms on the first American offshore wind power purchase agreement (PPA). The story of how Bluewater Wind won the project over the competing bids of fossil-fuel based power providers is clearly described in a September 2008 New York Times Magazine article, entitled: *Wind Power Politics*. A detailed chronology of this first American offshore success story is presented on the University of Delaware Offshore Wind and Bluewater Wind websites.[26]

Wind energy's permanent price stability made a big difference in this project's smooth sailing. The people of Delaware responded favorably to the Bluewater Wind idea from the beginning. In the summer of 2006, the Delaware public service commission was directed by an act of the legislature to secure energy generated within the state.[27] A restructuring of the state's electricity market and the subsequent removal of price caps, which for seven years had kept Delaware electricity prices artificially low, preceded consumer electricity price increases averaging more than 55%. There was very strong public sentiment about the pending return to market pricing. Offshore wind promised to stabilize the cost of power.

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[25] *ibid.*

[26] Web references http://www.ocean.udel.edu/Windpower/deproject.html and http://www.bluewaterwind.com

[27] HB 6 web reference http://legis.delaware.gov/LIS/LIS143.NSF/vwLegislation/HB+6?Opendocument

In response to a Delmarva RFP, Bluewater Wind submitted a successful 3,400-page document describing a 200-turbine, 600-megawatt, $1.5 billion offshore wind farm as an alternative to coal and gas plant proposals by competitors. Following contract renegotiation, the offshore wind project is expected to begin generating up to 450 MW power in 2014. The plan calls for 150, three-megawatt turbines located roughly 12 miles off the central Delaware coast – in federal waters. Final regulations regarding the leasing of land on the Outer Continental Shelf will need to be adopted by the US DOI/MMS before the project can be permitted.

Extensive use of seascape imagery, computer-generated views of how the turbines will really look on the horizon, and dozens of public presentations about the project, helped to reduce speculation about negative impacts. While the central coast is an area valued for scenic vistas and vacation resorts, public enthusiasm for the project has been very high (Firestone, 2008). The project will provide Delmarva Power's residential and small business customers with approximately 30% of their electric energy.

Summary: The Delaware experience is worth studying because it has moved farther and faster than any other offshore project in the United States. Success is explainable, at least in part, by the combination of dramatic electric energy price increases looming on the horizon for the region and by skillful advocacy in public education and public affairs.

4.4 New York – LIPA and NYGLOW

Long Island Power Authority

In January of 2003, Long Island Power Authority (LIPA) issued an RFP seeking proposals from vendors to "develop, own, operate, and maintain a 100-140 MW wind powered electric plant" to be located within a target area off the south shore of Long Island. In June of 2004, the proposal of Florida Power and Light Energy (FPLE) was accepted. It called for construction of forty 3.6 MW units, constituting a total maximum generating capacity of 144 MW.

Things have not gone well for LIPA, in fact, the Long Island project was declared "dead" in August of 2007 by incoming LIPA CEO-President Kevin Law. This followed a study to "assess the assumptions and economic impacts of the project."[28] The controversial study confirmed that development prices had risen dramatically worldwide. It also noted that costs for developing offshore wind projects in Europe are considerably lower than they would be in the US due to the experience in building such projects there and because of the government incentives offered. The outgoing LIPA CEO is quoted in meeting minutes (October 2, 2007) as stating, *"a renewable energy project of that size and scope will cost more than a traditional energy project, like a gas or an oil-fired plant, and you have to be willing to pay up front for what you're going to get in the future."* He continued that while it will cost Long Islanders an extra two-and-a-half dollars per month to begin to reduce our dependence on oil, oil companies and OPEC, he believes that "most Long Islanders will be willing to pay it."[29] Nevertheless, the pioneering project died.

In September of 2008, New York formed a working group with Con Edison to explore the feasibility of developing a second 300 MW marine wind field offshore Queens. In addition, state

[28] Web reference http://www.lipower.org/newscenter/pr/2007/pace_wind.pdf
[29] Web reference http://www.lipower.org/pdfs/company/papers/minutes/100207.pdf

agencies are reportedly engaged in a regulatory review of a 10 MW wind farm in Gardiner's Bay at the northeast tip of Long Island.

New York Great Lakes Offshore Wind

The LIPA stalemate off the eastern seaboard of New York described above has not stopped western New York's pursuit of offshore wind. In the spring of 2008 the University at Buffalo Law School Environment and Development Clinic presented a report to the state's Wind Action Group, entitled *"NYGLOW, Creating a Public Plan for New York's Great Lakes Offshore Wind Power A Strategy for Energy and Economic Development"* (NYGLOW, 2008). NYGLOW's focus is described concisely in the report:

> "The potential economic development, environmental, and energy benefits of NYGLOW are discussed and a strategy for siting, environmental review, and incentives to gain public acceptance and attract significant investment in NYGLOW is recommended, drawing on other approaches used for developing Offshore Wind elsewhere in North America."

Identifying the most appropriate places for wind development is part of the NYGLOW strategy,

> "The first step in a long-term strategy for developing Offshore Wind in New York's Great Lakes is to identify areas more and less suitable for Offshore Wind development using the SEQR Generic Environmental Impact Statement (GEIS) or NEPA Programmatic Environmental Impact Statement (PEIS) processes as a guide. To satisfy the objective of identifying areas more or less suitable for development, the GEIS or PEIS processes would likely require additional collection of data regarding such issues as avian migration routes, the presence of sensitive lake species and habitat areas, likely visual and economic impacts, effects on navigation, and effect on water quality, as well as analysis of the energy development potential, both theoretical and practical, of Offshore Wind. From this assessment, the prudent level of Offshore Wind development could be determined, standards for mitigating adverse environmental impacts could be developed and the number of turbines which would be the basis for an RFP could be decided. ....The benefits of this approach, again as recognized in New Jersey's strategy, is to minimize the risk of adverse environmental impact on the Great Lakes ecosystem, provide a forum for public participation, and to lower the risk to developers of unforeseen delays and construction requirements."[30]

Proponents hope to begin locating New York's offshore wind development areas in 2009.

4.5 Texas – Galveston Lease

The State of Texas General Land Office has entertained a number of offshore wind lease offers in recent years. While most of the proposals were abandoned, news reports indicate that Wind Energy Systems Technology (WEST), a company that holds all five remaining offshore wind leases in state waters in the Gulf of Mexico, is still looking for $311 million to build a 62-turbine farm nine miles off Galveston, in 50 feet of water. It recently lost two potential investors (Lehman Brothers and Wachovia) but WEST still hopes to get the Galveston wind farm

[30] NYGLOW, 2008. Page 41

operating by the end of 2010, offering energy retailing at 6.5 cents per kilowatt hour.[31] The terms of the 30 year wind field bottomland lease, an American first, would provide a projected minimum of $26.5 million in payments to the state's Permanent School Fund (Texas Lease, 2008).

4.6 Massachusetts – Cape Wind

Thousands of pages have been written, including a recent book, about the Cape Wind development process in Massachusetts' Nantucket Sound, which was first proposed in 2001 (Whitcomb, 2007). The 4,000 page MMS Draft Environmental Impact Statement issued in January 2008, which followed the 3,800 page USACOE Draft Environmental Impact Statement issued in 2004, generated 42,000 written public comments.[32] The Cape Wind proposal consists of one hundred thirty, 3.6 megawatt wind turbines covering 24 square miles in Federal waters. Some of the electric cable route passes through state waters and shorelands, which provides state and local agencies with some limited jurisdiction over the project.

While there are many strong opinions in the air, the jury is still out on the question of why the Cape Wind project has been so difficult for all concerned. The leading causes for concern among opponents are perceived environmental degradation, landowner aesthetics and diminished recreational use values, along with a sense of little direct benefit to local coastal residents. A recent survey indicates that "an important part of the opposition to offshore wind power projects is that the proponents have not successfully articulated a larger vision…" (Firestone, 2007).

In 2005, the state Energy Facility Siting Board approved Cape Wind's electrical interconnection at the conclusion of an unprecedented 32-month review of 2,900 pages of transcripts, 923 exhibits and 50,000 pages of documentary evidence. In October 2007, the Cape Cod Commission denied Cape Wind's plan to build transmission lines from Yarmouth to the 25-square-mile site of its proposed 130-turbine wind farm in the Sound. This was appealed to the Siting Board, which is expected to rule in late 2008. Public acceptance of the project appears to be gradually rising in Massachusetts, even among Cape landowners, as the proposal moves through the permitting process (Opinion Research Center, 2008).

5 The Great Lakes

European, North American and other international companies are anticipating the development of new regulatory schemes in the United States. And while substantial progress has recently been made in regulating wind proposals in marine environments (*c.f.* the 2008 USDOI Minerals Management Service Proposed Rule and Programmatic Environmental Impact Statement and the 2008 State of Rhode Island Office of Energy Resources Offshore Wind Stakeholders Report), the

[31] October, 2008 Web reference http://greeninc.blogs.nytimes.com/2008/10/10/a-few-snags-but-hopes-are-still-high-for-offshore-wind-in-texas/

[32] Web references http://www.mms.gov/offshore/RenewableEnergy/PDF/CWNOA.pdf (MMS) and http://www.nae.usace.army.mil/projects/ma/ccwf/deis.htm (USACOE).

definition of offshore wind's legal, cultural and physical environments around the Great Lakes states is just beginning. Little action has resulted from a 2005 workshop on energy-related bottomland habitat disturbances commissioned by the Great Lakes Fishery Commission.[33]

5.1 Michigan – First Steps

Unlike the states of Texas, Rhode Island, New Jersey, Delaware, New York and Massachusetts discussed above, Michigan has not yet been approached by industry with an offshore wind development application. In anticipation of an industry proposal, mock-applications for two 500 MW offshore wind fields in the Great Lakes were submitted to the Michigan Department of Environmental Quality by the Michigan Economic Development Corporation during a "dry run" permitting exercise with federal and state agencies in early 2008 (Dry Run, Klepinger, 2008). The Dry Run report recommended that the State of Michigan should consider taking the following measures to enable and promote the timely development of wind-energy resources in the State:

- Establish an offshore wind-energy technical-siting council that would, within a suggested three-to-six month lifespan, identify criteria for mapping the least favorable development areas ("categorical exclusion areas") as well as the most favorable development areas ("best potential areas").
- Enact legislation or adopt an executive order that would authorize offshore leasing by non-riparians.
- Enact legislation or adopt an executive order that would provide coastal power transmission facilities essential service status.
- Determine how the public will be compensated for wind rights.
- Develop a handbook describing the process that will be used to engage all Michigan stakeholders in wind-energy development.

The Dry Run was not designed to evaluate the efficacy of Michigan's offshore development public engagement mechanisms or the economic viability of the hypothetical fields. Its purpose was to test the preparedness of regulatory and management agencies to process all permitting requirements. It helped Michigan discover policy issues and identify data needs ahead of a real-world development proposal. It started a conversation on offshore wind resource management.

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[33] Dempsey *et al.* 2006. Conserving Great Lakes Aquatic Habitat from Lakebed Alteration Proposals. 100 pp. Report to the Great Lakes Fishery Commission. The Lakebed Habitat Alterations Workshop was held in September, 2005. Fisheries biologists and managers, coastal policy and permit staff, and representatives of non-profit organizations discussed how to conserve lake and riverbed habitat. While their report was not focused on wind field planning, the project team developed a GLFC position statement and guidelines for protecting "essential submerged bottomlands resources" in association with energy-related bottomland alteration. Great Lakes jurisdictions were encouraged to use the report to develop their own policies.

5.2 Ontario, Canada – Site Identification

In a 2008 report prepared for the Ontario Power Authority (OPA), Helimax Energy Inc., identified 64 utility-scale offshore wind areas on the Ontario side of the Great Lakes (Helimax Energy Inc., 2008). Each of these 64 areas has a minimum capacity of 100 MW when an installable capacity density factor of 5.8 MW/km² is used. The study procedure used existing data to refine Ontario's choices by applying "constraints" and "factors" to the tens of thousands of square miles under provincial jurisdiction. A short list of "constraints" (for example, water depth over 30 meters) was used to discard unsuitable areas as a beginning-point and then selected factors were applied to qualify the remaining areas. "Factors," which are weighting mechanisms, were jointly determined by OPA staff and Helimax. They are "considerations generally known to influence a developer's selection" of offshore development sites.

A selection of physical constraints (for example, shipping lanes) and environmental constraints (for example, designated wetlands and protected areas) were considered undevelopable and subtracted from the study area or they were given buffers of between 150 and 1,000 meters. After several areas large enough to support utility-scale wind projects were identified, mesoscale maps from the Ontario Wind Resource Atlas were used to estimate the wind resource and the net energy yields. Finally, four technical parameters were applied – wind speed, development complexity, social and environmental factors and presence of infrastructure. The report points out that a number of factors that would be critical to in-depth site studies prior to development were not systematically evaluated, including lakebed properties and icing conditions. Important socio-economic parameters such as visual impact, public acceptance and economic viability were similarly excluded from the study.

Canadian offshore wind development has not yet begun, in part because the Ontario Minister of Natural Resources put a moratorium on offshore development application acceptance in November 2006. This followed a protest against a Lake Erie offshore wind project near Leamington, approximately 30 miles east of Windsor. The moratorium was lifted in February 2008 and several projects are now in the works. According to news accounts:[34]

> "One such project has been put forward by Trillium Power Wind Corporation. This project is sited in the northeast corner of Lake Ontario where winds average approximately 24 kilometers/hour, and the company believes that it will be perfectly suited to take advantage of Ontario's wind resources."

Trillium intends to build a jack-up barge of its own to help with construction of its wind farm. A jack-up barge can stand still on a lakebed, move up and down via hydraulics, and act as a diving or construction platform. "We feel that we can build an industrial supply chain in North America. We have the spare capacity and the ability. We also have a tremendous regulatory regime in Ontario and we have all the pieces in place to move forward. It's a big win for all the Great Lakes," notes president Jack Kourtoff. Trillium announced the creation of Tai Wind, a consortium of North American offshore wind developers who hope, by combining their collective needs, to attract a turbine manufacturer to Ontario. Germany's Multibrid is seriously considering the invitation and has begun high-level discussions between its executives and

[34] http://www.electricenergyonline.com/IndustryNews.asp?m=1&id=83124

Ontario government officials. Toronto Hydro Corp. has considered an offshore wind project in Lake Ontario near the Scarborough Bluffs. That wind farm would have a capacity of up to 200 megawatts.[35]

Action point: The OPA-Helimax screening and wind area identification process, if modified slightly by Michigan policy-makers, provides a useful framework for the early stages of Michigan offshore wind planning. After creating a list of "net social values" (described above, see Hoagland, on page 17) Michigan policy-makers could use an open dialog to identify a short list of physical constraints, environmental constraints and social constraints for use by GIS technicians, who would then produce a map of each lake. This short list would be the state's criteria for mapping the "best" and "worst" areas for offshore wind development. This first mapping might require just a few days. In subsequent meetings, Michigan policy-makers could then apply a list of "weighting factors" to the remaining Michigan Great Lakes territory to develop a tri-colored map of "off-limits" or "categorical exclusion" areas; "further consideration" areas; and "primary areas for wind industry investigation" or "best potential" areas (precise wording of these labels is important, policy-makers should thoroughly discuss their meaning). This screening process would help foster informed public participation in coming years as industry identifies sites for development. It could also help agencies when they prioritize budgets and the allocation of resources. Compare to the Greenpeace-Garrad Hassan scenario building process. See section 6, Policy Development, Greenpeace, page 29.

5.3 Wisconsin – WOW

The 2008 effort of our neighboring Wisconsin Public Service Commission's study group, Wisconsin Offshore Wind (WOW) is another project Michiganders should be aware of as the state formulates its own offshore wind development policy (WOW, 2008). The WOW group was directed in April 2008 "to assess the potential for the development of wind energy resources in Lake Michigan and Lake Superior." In the course of the next 6 months, it found that "while offshore wind projects in the Great Lakes are technologically feasible, there are significant technical, economic, environmental, and legal issues to resolve."[36] *Harnessing Wisconsin's energy resources: an initial investigation into Great Lakes wind development* may be criticized by some as being too far-reaching and by some as too constraining but it does raise many current issues that are unique to the Great Lakes. The report was produced by small groups of professionals and other interested stakeholders. They conducted research and drafted working papers for the Wisconsin Public Service Commission.

5.4 Ohio – Demonstration Project

Ohio has not undertaken a statewide offshore wind planning effort but there are organized efforts to develop a demonstration project near Cleveland, the Lake Erie Offshore Wind Energy Demonstration Project and Research Center. For more information on the (Cuyahoga County) Great Lakes Energy Development Task Force effort, see the group's 2007 report *Building a New Energy Future* (83 pp.) and learn more about its feasibility study due in February 2009 on the web at http://development.cuyahogacounty.us/pdf_development/en-US/windenergy_report.pdf.

[35] http://www.thestar.com/News/Ontario/article/294044

[36] Public review and comment on the draft is scheduled to be completed by early 2009.

6 Policy Developments of Three Leading Environmental Organizations

6.1 Greenpeace – European Offshore Scenarios

Greenpeace commissioned a 2004 study of offshore wind development issues and opportunities in Europe, conducted by consultant Garrad Hassan: *Sea Wind Europe*.[37] Greenpeace was interested in testing the assumptions behind its own aggressive European Union offshore wind development targets of 240 GW by 2020. Greenpeace used GIS to gain an appreciation of the scale of development implied by the target of 240 GW offshore wind power in European waters. Scenario-based maps are reproduced in the appendix of the document and summarized in the text. There was no attempt to show likely deployment locations.

Assuming a density of 8 MW/km2 and a typical power curve from a typical modern offshore wind turbine, Greenpeace derived an annual energy yield for each kilometer-sized GIS grid square in European waters. Then, bathymetry and distance to shore were factored-in to determine potential resource and possible siting areas. Next, shipping lanes were buffered one kilometer by removing any of the GIS grid squares adjacent to shipping lanes shown on published nautical charts. Three time-sequence scenarios were created and the following assumptions were then applied to add new GIS data layers. Maps are presented in the document with the prominent disclaimer: *"All maps are purely indicative to show development scale. There is no suggestion that the resulting locations are where wind farms should, or could, be sited."*

5-YEAR Scenario

Offshore fields occur "in areas within a band 5 to 30km from shore, and within 30m depth. The 5km boundary was to reflect a general move by some countries to impose a coastal buffer zone for very large offshore wind farms on visual grounds. The 30km from shore and 30m depth constraints reflect a combination of anticipated technical and cost-related limitations to 2010."

10-YEAR Scenario

Within about ten years, offshore fields would likely begin to occur in slightly less desirable (from industry's point of view) and more expensive areas. "[A]dditional area was therefore released by relaxing the depth limitation to 50m and the distance limitation to 5 to 40km."

15-YEAR Scenario

The third scenario shows areas "outside the 40km from shore constraint, and at depths to 100m."

Greenpeace used its set of primary exclusions (depth and distance, shipping lanes) and these three scenarios to carry-out a conversation in 2004 with Greenpeace members and staff and to make judgments about siting. Although a prominent disclaimer was used in an apparent attempt to soften public reaction, specific sites (shown as pink quadrangles on the maps) for wind development were identified to show how each member-state of the European community might share in the issues and opportunities found in offshore wind development.

[37] Web reference http://www.greenpeace.org/raw/content/international/press/reports/sea-wind-europe.pdf

Action point: The Greenpeace-Garrad Hassan time sequenced scenario-building process, if modified slightly by Michigan policy-makers, also provides a useful framework for Michigan. This is especially true if a policy-driven production target (e.g. 2,050 MW by 2050 or 500 GW by 2050) is set by policymakers. Michigan policy-makers could use an open dialog during a few initial meetings to identify a production target and timeline. They could then identify a set of primary exclusions (e.g. depth and distance, shipping lanes, ice cover, underwater heritage sites) for use by GIS technicians, who could produce a map for each lake. This first mapping might require just a few days. In subsequent meetings, Michigan policy-makers could then explore the implications of using their informed judgment to locate "primary investigation areas" at enough places in the remaining Michigan Great Lakes territory to accommodate the production target (e.g. 2,050 MW). This would allow GIS technicians to develop time-sequenced maps reflecting proposed Michigan policy. The modified Greenpeace area identification process would help foster informed public participation in coming years as industry identifies sites for development. It would also help agencies when they prioritize budgets and resource allocations. For comparison, see Ontario, Canada – Site Identification, page 27.

6.2 United States NGO Policy Statements

Two leading US conservation organizations have published wind power positions.

Sierra Club Position Statement on Offshore Wind Development[38]

"It is likely that offshore development of wind will be an important component of reversing global warming. The Club hopes to work toward a reasonable balance between environmental and aesthetic concerns and the need for clean energy. Offshore site analysis should include a determination of significant habitat for non-endangered species. The Club will not generically oppose offshore projects. However, offshore projects have their own set of sensitive issues that must be considered. As with land projects, it is crucial that meaningful public participation be offered and that site-specific and substantial environmental concerns be addressed and remedied. Studies of all significant aspects of offshore wind development, including the effects of underwater structures on habitat, bird mortality [a 2007 Sierra magazine article noted that bird deaths from wind turbines are insignificant when compared to the number of birds that could be killed by global climate change], impacts on marine mammals and shoreline, proximity to sensitive and protected areas, and other issues should be performed as significant issues are identified."

Audubon's Position on Wind Power (Summary and Rationale)[39]

"Audubon strongly supports properly-sited wind power as a clean alternative energy source that reduces the threat of global warming. Wind power facilities should be planned, sited and operated to minimize negative impacts on bird and wildlife populations." "The Intergovernmental Panel on Climate Change (IPCC) has clearly stated that the impacts of climate change are here now and will get worse.[cite] Scientists have found that climate change has already affected half of the world's wild species' breeding, distribution, abundance and survival rates.[cite] By mid-century, the IPCC predicts that climate change may contribute to the extinction of 20-30 percent of all species on earth. In order to prevent species extinctions and other catastrophic impacts of climate change, scientists say we must reduce global warming

[38] Web reference http://www.sierraclub.org/policy/conservation/wind_siting.asp December 2008.
[39] Web reference http://www.audubon.org/campaign/windPowerQA.html December 2008.

emissions by at least 80 percent by 2050. Reducing pollution from fossil fuels to this degree will require rapidly expanding energy and fuel efficiency, renewable energy and alternative fuels, and changes in land use, agriculture, and transportation. To avoid catastrophe, we need to do all of these. Wind power is an important part of the strategy to combat global warming...."

Recent American NGO Action

In November 2008, twenty of the nation's conservation groups, environmental groups and wind energy companies announced the creation of the American Wind Wildlife Institute "to facilitate timely and responsible development of wind energy while protecting wildlife and wildlife habitat."

7 Public Engagement

Research in European countries indicates that residents who have lived for some years with wind power consider offshore wind an environmental improvement as compared to onshore wind power. Swedish research recommends to the wind industry that if producers are interested in differentiating their products further and successfully marketing wind power as a "green" electricity source they should give prominence to offshore installations (Ek, 2002).

European researchers investigating the rate of growth of wind power in several countries recently identified "four types of institutional variables likely to have an impact on wind power deployment outcomes. These are: the planning rules themselves, the financial support mechanisms organised by the state, organisations concerned with landscape protection, and ownership patterns of windfarms" (Toke et al, 2008).

The likelihood of development, in other words, can be predicted by the amount of wind resource available and by the proximity to load centers; while the timing of development is very directly influenced by four variables that relate to public engagement:

- State planning policy and practice
- Financial support of the jurisdiction
- Involvement of community organizations
- Structure of ownership and equity, benefit/cost structures

All four timing variables tend to manifest themselves in the public's reaction to the proposed new landscape. Acceptance rises when stakeholders have early influence on how the landscape will change (Wolsink, 2000; Devine-Wright, 2005; Wolsink, 2007; Ellis, 2006; Toke, 2008).

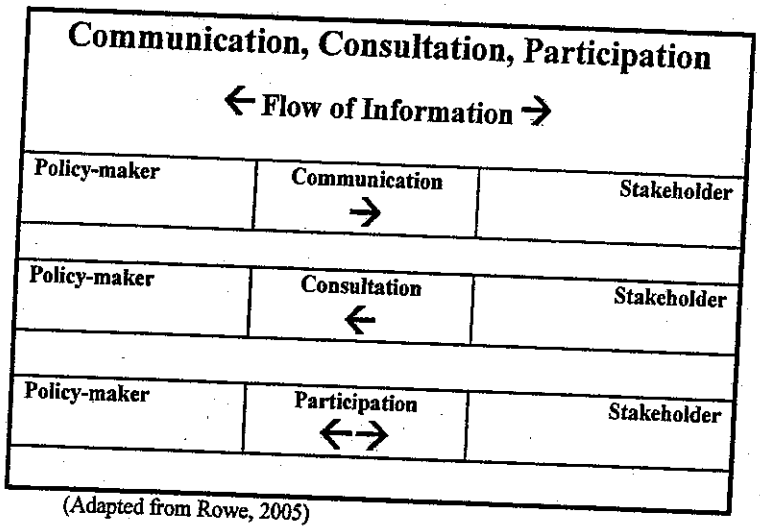
While most of the available research on public acceptance of wind farms comes from the terrestrial environment and the observations of Dutch scientist Maarten Wolsink are no exception in that regard, his work summarizes the issues surrounding public acceptance of wind systems:

"Visual evaluation of the impact of wind power on landscape values is by far the dominant factor in explaining why some are opposed to wind power and others are supporting it." "Decision making on renewable power facilities does not usually include the most important discussion point for public stakeholders, which in the case of wind farms is the choice of the location." "Consultation after a plan has been announced is more of a trigger for

opposition than an incentive for the proper design of acceptable projects. The 'public hostility' that sometimes emerges is mostly triggered by those top–down processes" (Wolsink, 2007).

Beyond the "public notice" and "opportunity to comment" provisions of American laws and regulations, there are a number of proven ways to enhance significantly public involvement in public resource management (*cf.* New Economics, 1999). A general definition of public participation is "the practice of involving members of the public in the agenda setting, decision-making, and policy-forming activities of organizations/institutions responsible for policy development" (Rowe, 2005).

The flow of information during public resource management determines how effective stakeholders perceive public communication, public consultation, and public participation are perceived to be.



(Adapted from Rowe, 2005)

The effectiveness of a public resource management effort can be judged by the efficiency with which full, relevant information is elicited from all appropriate sources, transferred to all appropriate recipients, and then used to arrive at new policy. When effective, the process can be said to be "engaging" of stakeholders. Stakeholders are the ultimate judges of effectiveness. People want to be invited to participate and they want their input given due regard.

Scientific studies of public resistance to (or acceptance of) offshore wind power development are relatively scarce, although several useful land-based studies have been conducted over the last two decades (Sorensen, 2002; Ladenburg, 2008; Firestone, 2008). One ranking of the strongest impacts on public attitudes to wind field development proposals (on land) lists the aesthetics of turbines, the perceived impact on the landscape, concerns about noise pollution and hazards to birds (Ellis, 2006). Studies conclude that although active public involvement requires time and public resources, it tends to lead to mitigation of general protests, streamlines projects and increases future confidence, acceptance and support of offshore wind.

Much has been written about the "not in my backyard" (NIMBY) effect of large developments on land. NIMBY resistance has been attributed to personal loss or property degradation and it is most commonly understood to spring from individual selfishness. But recent wind siting research indicates that public feelings about equity and fairness appear to be the primary determinants of NIMBYism, instead of selfishness (Gross, 2006; Wolsink, 2007). Public policies and practices that demonstrate the value of early and effective public engagement appear to alleviate equity and fairness issues. These equity and fairness issues most often manifest themselves in public reaction to the visual representations of the proposed new landscape during the development process.

Environmental protection groups are weighing the costs and benefits of wind around the world. Climate change has people talking. Lively conversations about managing resource values are taking place as the net social values of offshore wind come into focus. Looking again to the experience of those most experienced with wind power, recent research and commentary indicates that leading Danish environmental organizations, the World Wildlife Fund, Greenpeace and Danish ECO-Council generally support development of wind power "because of their interest in finding effective ways to reduce greenhouse gas emissions" (Zeelenberg, 2006).

Ownership patterns also influence public acceptance levels (Toke, 2008). The first large-scale wind field, consisting of 20 turbines developed in 2000 at Middlegrunden near the Danish capital of Copenhagen, was financed largely by ratepayers through a cooperative. Today more than 150,000 Danish families are members of wind farm cooperatives. The Danish wind turbine industry employed about 25,000 people and contributed roughly $8 billion to gross domestic product in 2007. These constituents have families and neighbors who realize how important the wind industry is to sustaining their economy. An economic stake in wind power naturally strengthens support.

8 Lessons Learned from the Offshore Experience of Others

8.1 Summary for Michigan Policy-Makers

EUROPE

A widely read report published in 2002 characterized European offshore wind siting policy:

> "Offshore wind energy policy is, in most countries, still in an early stage of development. [In most places we find] a complicated network of procedures, acting as a disincentive to project developers" (Shaw, 2002).

European studies have identified "one-stop" permitting as the most significant of several best practices governments could adopt to advance the development of offshore wind. Michigan has already codified the notion of one-stop permitting for Great Lakes bottomland permit applicants in the MDEQ joint-permit process under Michigan's NREPA Part 325. However, offshore wind development raises more than environmental quality issues and at present there are no clear wind project leasing guidelines for decision-makers. The state should establish a one-stop permitting process for the specific concerns of offshore wind.

The MDEQ should consider modifying its materials to include a document along the lines of the British *Guidance Notes* to make Michigan's permitting process highly effective in regulating offshore wind development. The document could specifically address the concerns of offshore wind developers and other wind stakeholders – of proponents, opponents and those stakeholders who have not taken strong positions.

The state should also consider establishing a trust similar to the British COWRIE, and creating a permanent panel to guide offshore wind environmental research, data collection and dissemination. The state may, or it may not, want to require cash payments during the early years of its offshore wind management program but the idea of a trust should be evaluated.

Public policies and practices that foster early and effective public engagement appear to alleviate equity and fairness issues, streamline the development process and increase public acceptance. European experience suggests that geographic variables, such as the quantity of wind near a city or an industrial load center, are in themselves insufficient to explain patterns of implementation of wind power in different nations or states.

Planning requires consideration of the best data currently available but it cannot wait for perfect data. Adaptive management is widely accepted and applied to offshore wind in Europe.

USOWC-HOAGLAND

The Hoagland framework discussed above can help structure policy-making to account for the regional nature of offshore wind resource management. Great Lakes wind is a state resource that must be managed regionally - across local jurisdictional or individual interests - while accommodating state-level legacy or inheritance values. The Hoagland framework also anticipates Michigan's need for multiple-use and public trust resource management. Great Lakes

wind development will occur to the exclusion (at least for some period of time) of other uses of the bottomlands, the water column, or surface area. Policy-makers should carefully weigh the consequences and timing of these exclusions. They must find a balance where competition between resource values occurs.

The following steps, adapted from and paraphrasing the features in the Hoagland report, could provide a starting-point for constructing Michigan's offshore wind access system:

General Management Features

- Create state-level policy objectives. State the purposes and rationale for allowing access to Michigan's Great Lakes wind resources. What would be the "net social values"?
- Conduct an initial resource assessment. Identify high and low resource quality areas relative to load centers and transmission facilities, both existing and planned. Identify regional values, characterize tradeoffs, and identify methods for resolving conflicts.
- Consider a regional approach to state-level planning. Learning from Great Lakes fisheries managers, teams could plan for sustainable energy development in each of the diverse Great Lakes within the scope of new state-level policies.
- Consider the needs of state agencies. Identify the agency responsible for resource management within selected wind planning areas and estimate the resources needed by the lead agency and supporting agencies.
- Establish environmental requirements. Describe detailed environmental assessment and monitoring requirements for pre-construction, construction, and post-construction phases.

Financial Features

- Set the financial terms. What should the state require in return for access to Great Lakes wind resources: royalties, rentals, license fees, others? Should subsidies or favorable terms be granted to encourage development in selected areas or for a number of years, including tax credits, tax deductions, accelerated depreciation, grants, price floors, payment relief periods/conditions, other mechanisms?

Allocation of Legal Interests

- Determine the procedure for allocating sites to developers (first come, first served; competitive auction; requests for proposals in selected areas over a period of years; other).
- Decide on conditions or requirements leading to termination or revocation of legal interests and describe the decommissioning of structures.

The Hoagland framework accommodates a single-agency permitting approach to offshore wind development, which is in line with Michigan's current Department of Environmental Quality bottomland permitting process. A reduction of jurisdictional complexity serves all concerned: taxpayers, developers and current or future residents. Fairness to all stakeholders and assurance of a comprehensive decision-making perspective are best served by a one-stop system rooted in the sustainable principles of precaution and adaptive management.

Finally, it is important to mention that the Hoagland framework is, in the opinion of some observers, perhaps too constrained by traditional economics when it addresses environmental monitoring. Quoting the Hoagland report: *"Monitoring is arguably an unnecessarily onerous and potentially economically wasteful feature of an access system for ocean wind. The uncertainty associated with the construction of a permanent set of towers in an area of the ocean*

is the main rationale for including monitoring requirements.... " *"[M]onitoring at ocean wind farms is an activity designed to clarify whether or not external effects occur, rather than one to measure the scale of pollution that is known to occur."* Michigan policy-makers can replace any part of the framework with provisions more suitable to Great lakes circumstances. The art and science of ecosystem monitoring around Great Lakes wind fields will evolve.

Michigan decision-makers do not have guidelines for structuring environmental monitoring or reporting during the phases of an offshore wind site development but they do have the benefit of European (particularly Danish) experience. Recognizing this shortfall during the Michigan 2008 Dry Run, regulatory professionals identified several data gaps for site specific and area wide planning (discussed in section 5, page 27 of this paper). Integrated resource planning and adaptive management techniques anticipate these data gaps. Field studies must be scheduled and research targets must be expected to change over the years. Data gaps should be accommodated in the process of offshore wind resource management.

Michigan has never identified the range of public purposes it would like to meet through an allocation of Great Lakes wind farming space (i.e. bottomland, water column and surface space). Wind power is a clean, indigenous, and non-depletable resource – a component of a sustainable energy system. It has long-term economic, environmental and public health benefits but, like other energy choices, deploying wind will require trade-offs. Michigan policy-makers can apply the Hoagland framework as they distil the state's public purposes (and the values they embody). Identifying these public purposes in a public conversation is a key to the current policy-making challenge. These value statements should precede creation of a list of criteria for mapping the best and worst places to site wind fields.

DOI/MMS

Michigan policy-makers could use most of the new DOI/MMS best management practices when crafting a larger framework for decision-making. MMS has stated that in general, most impacts would be negligible to moderate for all phases of wind energy development assuming that proper siting and mitigation measures are followed. As the state obtains additional information, it may adjust its first "preferred development zones" or "no-development zones."

If Michigan policy-makers decide to set a production target and/or schedule for offshore wind development, these new policies would help stakeholders understand the scale of the issues. Michigan has jurisdiction over 38,000 square miles of Great Lakes surface area; the state would need to find less than 200 square miles a to provide as much as 15% to 20% of its 2008 generating capacity with offshore wind.

RHODE ISLAND

Michigan can use a CZM/SAMP process similar to Rhode Island's if it so chooses, however, designation of offshore zoning has not been tried in the state or tested in the courts. Policy-makers should seek the advice of the MDEQ Coastal Management Program on how Michigan would fund and run a SAMP planning process.

Michigan should look closely at Rhode Island's site identification procedure and particularly at its stakeholder engagement process, described in the *Rhode Island Offshore Wind Stakeholders*

Final Report (RIOER, 2008. 23pp.). Rhode Island presented to the public10 selected offshore areas and conducted a replicable dialog on the specific social, environmental and economic aspects of wind development in these places. Rhode Island's two-step process: 1) identification of ten offshore areas by an informed statewide study team (ruling out some obvious areas early) and 2) the subsequent open stakeholder engagement effort is a good model to consider. The first step in Rhode Island made the second step more productive, less contentious.

NEW JERSEY

New Jersey set offshore wind production targets and initiated a state-private partnership to demonstrate the viability of offshore wind. This policy initiative creates a tiered and phased incentive program to foster early development of offshore wind energy.

ONTARIO

The OPA-Helimax screening and wind area identification process, if modified slightly by Michigan policy-makers, provides a useful framework for the early stages of Michigan offshore wind planning. After creating a list of "net social values" (described above, and see Hoagland, on page 17) Michigan policy-makers could use an open dialog to identify a short list of physical constraints, environmental constraints and social constraints for use by GIS technicians, who would then produce a map of each lake. This short list would be the state's criteria for mapping the "best" and "worst" areas for offshore wind development. This first mapping might require just a few days. In subsequent meetings, Michigan policy-makers could then apply a list of "weighting factors" to the remaining Michigan Great Lakes territory to develop a tri-colored map of "off-limits" or "categorical exclusion" areas; "further consideration" areas; and "primary areas for wind industry investigation" or "best potential" areas (precise wording of these labels is important, policy-makers should thoroughly discuss their meaning and agree on what is best). This screening process would help foster informed public participation in coming years as industry identifies sites for development. It could also help agencies when they prioritize budgets and the allocation of resources.

GREENPEACE

The Greenpeace-Garrad Hassan time sequenced scenario-building process, if modified slightly by Michigan policy-makers, provides another useful framework for Michigan. This is especially true if policy-makers set a production target (e.g. 2,050 MW by 2050 or 500 GW by 2050).

Michigan policy-makers could use an open dialog during a few initial meetings to identify a production target and timeline. They would then identify a set of primary exclusions (e.g. depth and distance, shipping lanes, ice cover, underwater heritage sites) for use by GIS technicians, who would produce a map for each lake. This first mapping might require just a few days. In subsequent meetings, Michigan policy-makers could then explore the implications of using their informed judgment to locate "primary investigation areas" at enough places in the remaining Michigan Great Lakes territory to accommodate the production target (e.g. 2,050 MW). This would allow GIS technicians to develop time-sequenced maps reflective of proposed Michigan policy. This area identification process would help foster informed public participation in coming years as industry identifies sites for development. It could also help agencies when they prioritize budgets and resource allocations.

8.2 Policy-maker Priorities: A List of Things To Do in 2009

8.2.1 Michigan's Offshore Wind Power Vision

As a starting-point for policy deliberations, Michigan policy-makers should develop a vision statement or modify the following draft by consensus.

> **Vision:** Adopt a proactive approach to offshore wind resource management for the benefit of all Michigan stakeholders.

This list of objectives is offered as a starting point for prioritization of near-term action items.

1. Embrace an adaptive management approach to wind resources that assumes management policies and management actions are not static but are periodically adjusted based on a combination of new scientific and socio-economic information in order to improve management by learning from the ecosystems being affected.
2. Compile a short list of constraints to offshore wind to set boundaries for public discourse.
3. Use the short list to create a graphic representation of three planning areas (not zones) for offshore wind: red (worst), yellow (mid), green (best).
4. Clarify the State's interests in offshore wind (environmental, economic, equitable) by elucidating policy relative to: fair rent for access to state offshore wind resource harvesting space; filling field data gaps for use in long-term adaptive management; listing the net social values of offshore wind.
5. Develop a timeline for offshore wind development, including a projected date for acceptance of its first bottomland lease application(s).
6. Set targets for the desirable amount of state offshore wind capacity in time-sequence: e.g. *X* number of MW capacity by 2015, 2020 and 2050.
7. Establish a web-based communication node similar to Governor Jim Gibbons' Nevada *Renewable Energy Transmission Advisory Committee* at http://www.retaac.org/ or modeled on the British site http://www.offshorewindfarms.co.uk/Pages/COWRIE/
8. Outline the content or oversee the iterative creation of a web-based publication, The One-Stop Guide to Offshore Wind Development Permitting in Michigan.

9 Recommended Reading Short List

9.1 Evolving Governance Structures

Although Michigan policy-makers are pioneering in their work, they do not have to plan or create a Great Lakes offshore wind regulatory framework from scratch – there are a few useful frameworks from which to learn. The handful of selected documents referenced immediately below are highly recommended, currently relevant reading for Michiganders. Context is provided for these in the body of the report and in References and Resources, below.

Please note that offshore wind is a rapidly evolving industry and that governance structures are also rapidly evolving worldwide. There are extensive print and internet-sourced materials available; approximately 200 print documents were examined for this report. The Reference section fully cites about 50 of them. A selected few illuminate very well the impact of government policy on the geography and timing of offshore wind development and within these selected few documents are approximately 150 pages highly recommended for closer reading.

Recommended Document 1. The work of Hoagland *et al* in their 2006 paper for the US Offshore Wind Council entitled, *Legal and Regulatory Framework for Siting Offshore Wind Energy Facilities,* offers a comprehensive framework for planning offshore wind siting (Hoagland *et al*, 2006. 156 pp., see especially page ii through page 47). This recent work is based on the notion that the state's overriding policy goal is maximization of resource rents from the use of ocean space used by wind developments (rather than, say, the public benefits of energy price stabilization or pollution prevention). Though compiled without direct consideration of Great Lakes freshwater wind development issues it nevertheless provides a solid foundation for the work of Michigan Great Lakes policy-makers. It contains a well-structured synopsis of social and environmental issues facing offshore wind development globally and a framework for discussion that could be most useful to Michigan. A more thorough examination of the report is above in US Offshore Wind Collaborative Framework, beginning on page 19.

Recommended Document 2. Michigan should look closely at Rhode Island's site identification procedure and particularly at its stakeholder engagement process, described in the *Rhode Island Offshore Wind Stakeholders Final Report* (RIOER, 2008. 23 pp.). Rhode Island presented 10 selected offshore areas to the public and conducted a replicable dialog on the specific social, environmental and economic aspects of these 10 places. The public participation process is currently unfolding. For more on this, see State Initiatives, Rhode Island, page 19.

Additional Reading, FYI. The 2008 effort of the neighboring Wisconsin Public Service Commission's study group, Wisconsin Offshore Wind (WOW), is something Michigan should be aware of as the state formulates its own offshore wind development policy (WOW, 2008. 194 pp., see especially page 8 through page 24). Another Great Lakes state report on the prospective development of freshwater offshore wind resources was recently compiled by the Environment and Development Clinic, University at Buffalo Law School at the State University of New York. *Creating a Public Plan for New York's Great Lakes Offshore Wind Power: A Strategy for Energy and Economic Development* was prepared for the New York Wind Action Group in early 2008. While it does not include a plan for siting or criteria for identification of development

areas, the New York report is worthy of consideration because it describes a strategy for neighboring New York's policy-makers to pursue.

In addition to the first two American publications recommended above, there are two European publications and one Canadian study deserving special attention.

Recommended Document 3. A synopsis of environmental work done at the world's largest offshore wind fields, *Danish offshore wind – key environmental issues,* provides important insights into the environmental monitoring and reporting process carried-out at Horns Rev and Nysted in the territorial seas of Denmark (DONG, 2006. 144 pp. See especially page 8 through page 19). For more information, see Offshore Wind Siting Policy in Denmark, page 5.

Recommended Document 4. The United Kingdom has issued permitting guidelines for developers and stakeholders. The 2004 publication *Guidance notes* [for] *offshore wind farm consents process* [permitting] is a particularly clear, concise and useful example of comprehensive energy siting protocols (DTI, 2004. 29 pp.). It is valuable to anyone with an interest in the planning process used for British offshore wind farms. For more information, see Offshore Wind Siting Policy in the United Kingdom, page 9.

Recommended Document 5. The Province of Ontario, Canada recently commissioned a study of wind resources by Helimax Energy, Inc. This study offers a consultant's template for screening potential wind sites and for weighing criteria related to Great Lakes values (Helimax, 2008. 40 pp.) For more information, see Ontario, Canada – Site Identification, page 27.

Additional Reading, FYI. Policy-makers wishing to put citizen perception and acceptance issues in perspective might like to read the journal article *Beyond NIMBYism: towards an integrated framework for understanding public perceptions of wind energy* (though it is written for social scientists) (Devine-Wright, 2005. 15 pp.). Further reading references on this topic are in the section on Public Engagement, see page 31.

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